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RELATIONSHIP OF THE PUBLIC HEALTH SERVICE TO THE PROGRAM FOR THE CONTROL OF SYPHILIS AND GONORRHEA IN GREATER NEW YORK [1]

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Recently an advisory committee to the Public Health Service recommended measures which it is hoped will be included in the venereal disease control program of State and local health departments (*1*). This committee report includes recommendations for the administration of the program, for the development of adequate treatment facilities, for the prevention of the prenatal transmission of syphilis, for epidemiological work, for the provision of modern laboratory facilities including diagnostic and inpatient treatment centers, for cooperation of health departments with physicians, for the problem of obtaining more reliable morbidity and mortality reports, and for the improvement of present methods utilized in the informative and educational program. Only general recommendations were included in the report so that they might be adapted to the varying social, economic, and racial conditions in all parts of the United States.

This program, which has been submitted for the consideration of health officers and other workers interested in the venereal disease problem, is believed to include all of the fundamental points in a comprehensive venereal disease control organization. The committee appreciated the fact that few health departments in the United States would be in an economic position to adopt a program embracing all of these principles. Nevertheless, the members thought it worth while to present all of the essential features in the control of syphilis and gonorrhea so that their recommendations might be used as a standard for the development of individual programs.

Any discussion of venereal disease control organization in a given area should be based upon a thorough knowledge of the conditions and factors which influence the program in that area. In considering the needs of Greater New York the writer must admit the lack of thorough knowledge of such conditions and factors. At the same time there is some advantage in viewing at a distance the program of

[1] Read before the Regional Conference on Social Hygiene, New York City, Jan. 15, 1936.

a given area and comparing it with other programs in areas more or less removed.

Greater New York represents a distinctly populous area with a prevalence rate for syphilis which is probably close to the average for the entire country. It is fortunate in having available a large number of sources of treatment either free, part-pay, or pay. Modern transportation makes it possible to travel to almost any part of the area within an hour's time. Under such favorable conditions considerable progress should have been made already in bringing syphilis and gonorrhea under control.

It would be impossible even for anyone thoroughly familiar with local conditions to point out in so short a time all the reasons why success has not been attained. But certain defects seem so obvious that they may well be enumerated here.

ALLOCATION OF FUNDS

In a recent publication (*2*) the health commissioner of the city of New York reported that for the year 1935 the sum of $145,000 had been made available for the venereal disease control program in the five boroughs of the city. He appreciated the need for a larger appropriation, as was evidenced by an expression of hope that more money would be available for work during the next year. He regarded the control of syphilis as the biggest single problem facing the health department. During the year 1935 the commissioner estimated (*3*) that approximately $700,000 would be expended on the control of all communicable diseases, including the venereal diseases. This estimate does not include the isolation and hospitalization of cases. The cost of isolation and hospitalization of communicable diseases amounts to much more than the expenditures for control work only. In addition, administrative policy in hospitals is much more liberal with regard to the care of tuberculosis and the acute communicable diseases than it is for cases of syphilis and gonorrhea.

In estimating the proportion of funds which should be allocated for the control of syphilis and gonorrhea, the morbidity reports from New York City, both for the venereal and for other communicable diseases, must be considered. During the fiscal year ended June 30, 1935, there were 57,182 new cases of syphilis and gonorrhea reported. In the same period, 98,212 cases of other communicable diseases were reported. Syphilis and gonorrhea, therefore, represented approximately 37 percent of all of the communicable diseases reported in that area for that year. On this basis, approximately $250,000 of the total for communicable disease control should be expended on syphilis and gonorrhea.

The allocation of funds is even more disproportionate if surveys of all sources of treatment are taken as the basis for estimating

morbidity. Everyone appreciates the fact that the venereal diseases are poorly reported, while morbidity records are reasonably complete for most of the other communicable diseases. A survey of all sources of treatment conducted by the American Social Hygiene Association in New York City more than a decade ago made it possible to estimate that approximately 40,200 new cases of early syphilis and 77,800 new cases of acute gonorrhea seek authorized medical care in this area each year. Compare this total of 118,000 new cases of syphilis and gonorrhea with the total number of cases of other communicable diseases and note the enormous importance which syphilis and gonorrhea assume. The allocation of funds for the control of the venereal diseases on such a basis would exceed $350,000, excluding the appropriation for isolation and hospitalization of cases.

Syphilis and gonorrhea are of more serious import than most of the other communicable diseases. The latter are, as a rule, self-limited, mortality is comparatively low, and complications do not usually follow. Syphilis and often gonorrhea are chronic in character and frequently result in late crippling manifestations. They are the cause of mortality to an undetermined but probably an enormous extent. These facts emphasize the need for a more equable distribution of public money in the future for venereal disease control work. The Public Health Service particularly desires that more money be allotted to such work when funds become available under the Social Security Act.

EFFICIENCY OF CLINICS

The recent survey of male gonorrhea clinics in New York City, made by the social hygiene committee of the New York Tuberculosis and Health Association, indicates the need for the adoption of minimum efficiency standards in such clinics. According to the report of this survey a number of defects were noted. These included high cost of treatment, crowding of patients, failure to segregate the sexes, lack of privacy when treatment is administered, poor and inefficient medical follow-up of patients, failure to perform physical examinations, failure to instruct patients in the public health importance of medical care, poor clinical records, and inadequate laboratory work, including failure to perform routine serologic tests for syphilis among such patients.

Syphilis clinics in New York City were studied in an earlier survey of the social hygiene committee of the same association. Practically the same defects were noted that have been found more recently in the survey of male gonorrhea clinics. Furthermore, it was shown that the darkfield examination for *Spirochaeta pallida* was properly employed in only 17 percent of the syphilis clinics. Jacoby (*4*) reported that, during the year 1932, only 651 suspected lesions were

examined by the darkfield method at the municipal clinics. The number of such examinations at these clinics had almost doubled in 1935. It still seems probable, however, that hundreds of cases of seronegative primary syphilis are not given the darkfield examination each time the procedure is indicated.

At a previous regional conference Goldberg (*5*) discussed the problem of the distribution of patients among syphilis clinics in New York City. In this discussion he noted that patients traveled from distant parts of the city to attend clinics quite far from home. He expressed the opinion that they did so because the treatment was free at these clinics or that they did not want to attend a clinic near their place of residence or employment because of the desire for secrecy. The latter circumstance may be of importance, although in a city the size of New York it should be easy to lose one's identity even in a nearby community. It is believed that the infected individual in any large city is likely to go to the treatment center which he thinks renders the most efficient service. In England, for example, Harrison (*6*) noted a very considerable increase in the attendance at a given treatment center following improvement in either the personnel or the physical facilities at the clinic. In one case he showed a doubled attendance a few weeks after a change in the location of the clinic and appointment of a new medical officer who was not only skilled in his specialty but was thoroughly imbued with the public health idea.

THE INFORMATIVE AND EDUCATIONAL PROGRAM

In Greater New York there are 83 clinics for the treatment of the venereal diseases, in comparison with 827 clinics throughout the United States, according to figures available to the Public Health Service. This represents a proportion of one clinic to approximately 130,000 people, as compared with one clinic per 150,000 population for the entire country. While this number of clinics is not believed to be sufficient to serve the population adequately, it would seem that it should have been possible long ago to have caused a material reduction in the incidence of syphilis if clinic organization had been efficient and the facts regarding early diagnosis and adequate treatment had been known by all citizens. Failure to bring about this decreased incidence must, to a considerable degree, be attributable to a deficiency in the informative and educational program.

This part of the venereal disease control program has long been recognized as one of the most important phases of the work. It has been impeded, unfortunately, by prudery and an unwillingness to face the facts. In recent years a concerted effort has been made to deal with syphilis and gonorrhea in the same way as with other communicable diseases. In the promotion of the educational pro-

gram among citizens, this fundamental principle should never be forgotten.

The conspiracy of silence which has prevented the use of modern methods of disseminating information pertaining to the venereal diseases will be broken down only by long and persistent effort. This effort is worthy of the untiring support of every worker interested in the problem. The greatest success can be attained, however, by arousing individuals of national repute to an appreciation of the importance of syphilis and gonorrhea and by persuading them to express their opinion publicly.

Collectively, the physicians in Greater New York are as well informed as those in any other area in the United States. This must be true, because the uninformed physician could not survive in an environment with such intense competition. Agencies interested in the public health control of syphilis and gonorrhea should not, however, become too self-confident and permit the informative campaign among physicians to lag. Even the progressive physician under the rigorous demands of private practice may lose sight of the magnitude of his responsibility in this program.

This part of the control plan will not have been completed until every citizen not only appreciates the dangers of the venereal infections, but realizes that if these infections are contracted, adequate early treatment and thorough observation will bring about recovery in the vast majority of cases.

COOPERATION OF PUBLIC HEALTH AGENCIES IN THE METROPOLITAN AREA

The metropolitan area of Greater New York may be said to include numerous cities in New York State, New Jersey, and Connecticut, the suburban areas in several counties of the two former States and one county in Connecticut. Public health agencies operating with varying degrees of efficiency are responsible for the direction of the venereal disease control program in these cities and suburban areas. Present modern transportation makes the individual citizen infected with syphilis and gonorrhea a danger not only to the citizens in the city or suburban area in which he lives, but also to those individuals with whom he comes in contact in the areas to which he daily travels. The interdependence of health agencies upon each other in the control of all communicable diseases is obvious.

For effective venereal disease control work the State and local authorities must cooperate. There must be complete and mutual interchange of information pertaining to the numerous epidemiologic problems related to the control of syphilis and gonorrhea. In addition to the exchange of such information, there is need for a more liberal policy in making treatment available to all citizens, regardless

of residence. These two points, while fundamental, represent only a part of the very cordial relationship which should exist between the health agencies and the clinics in this area. The Social Hygiene Council of Greater New York has accomplished much in coordinating the efforts of the agencies concerned. Its work should be continued and amplified, because the idea of mutual cooperation and coordination of activities is sound. Such activities should be extended to include all State and local organizations which have an interest in the control of syphilis and gonorrhea. The achievement of this ideal should greatly enhance the work of all local health departments in this area. The personnel of the Public Health Service offer their full support to the attainment of this end.

To summarize, the program directed against the venereal diseases in Greater New York should be intensified in the following ways:

1. The provision of funds in the future should be on a basis comparable to the gravity of the situation and in such amount that an efficient control organization may be built up. Morbidity reports and surveys indicate that a sum of at least $500,000 should be provided annually for New York City in order to cope intelligently with the problem.

2. To insure adequate treatment for all citizens, efficient clinics should be subsidized. The treatment centers should be reorganized, if necessary, in order that they may meet accepted standards of efficiency.

3. An energetic promotion of present informative and educational methods should be pursued.

4. A permanent and competent administrative division of venereal disease control should be organized in all local health departments. One of the chief functions of this division should be the coordination of the activities of all agencies interested in the venereal disease problem, and the reciprocal exchange of pertinent information with other health departments in the metropolitan area.

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STUDIES OF SEWAGE PURIFICATION

IV. The Use of Chlorine for the Correction of Sludge Bulking in the Activated Sludge Process

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The efficiency of many activated sludge sewage-treatment plants is materially affected at times by a diffuse or fluffy condition of the sludge particles, which, in the clarification tank following aeration, results in slow settlement and, hence, increased volume or "bulking" of the sludge. Consequently, in aggravated cases large amounts of these sludge solids may be carried over the effluent weirs instead of being removed through the bottom sludge outlets. Because this condition admittedly constitutes one of the "weak links" in this method of sewage treatment, our late consultant, Mr. George W. Fuller, recommended the advisability of the Stream Pollution Investigations Station of the Public Health Service undertaking some studies of the biological and biochemical factors involved in sludge bulking.

Extensive microscopical observations of activated sludges have indicated that there are at least two distinct conditions of the sludge floc, either of which when present will cause the sludge to settle with difficulty, if at all. One is a thin, diffuse or spongy, ragged floc, that tends to float because of its relatively large surface area; the other is a floc possibly of moderate or good quality, but heavily infested with thin fungus threads which extend out in all directions from the main body and thereby increase greatly the buoyancy of the floc and doubtless separate materially the individual particles as well. All gradations and combinations of these two conditions may occur in specific instances. Thus a floc that is quite fine, ragged, and diffuse may be settled in the final clarifier with reasonable success; but if a moderate growth of fungus should appear, the settling process is seriously retarded. The present discussion is confined to the bulking resulting from excessive amounts of fungus in the sludge.

For determination of the physical condition of sludge floc particles, the use of a low-power (preferably binocular) microscope, magnifying about 20 or 30 diameters, is most essential. Daily routine observations of the sludge by such an instrument will disclose any progressive changes in floc structure that signify either the oncoming improvement or deterioration of sludge-settling quality. By adjusting the substage mirror at a point slightly *in front* of the optical axis of the microscope to secure a dark field effect, and using a dilution (1 in 40 is suggested) of the sludge in a cell about 1 millimeter deep of the type used for plankton enumeration (with cover-glass adjusted), the floating flocs can be seen clearly outlined against a dark field and any attached fungus may be readily distinguished by reason of the light reflected

from their minute filaments, affording a sharp contrast with the surrounding dark field. A true picture of the undistorted floating floc, as it occurs in its natural environment in the clarification tank, is thus obtained.

References in the literature to bulking caused by fungus, including descriptions and characteristics of the causative organism, have been quite frequent. Many means have been suggested to inhibit the growth of the fungus, such as the addition of lime, increased aeration, decreased aeration, chlorine, elimination of carbohydrates from the sewage to be treated, and others. One of the difficulties experienced in the use of chemicals for this purpose has been that, when applied in a concentration sufficient to destroy the fungus growth, the normal fauna and flora essential for the functioning of activated sludge were killed and the effluent deteriorated rapidly.

Chlorine has been used in connection with the activated sludge process by many investigators. Dallyn and De Laporte (*1*), in 1926, reported chlorinating return sludge to give a residual of 0.05 p. p. m. without upsetting plant operation. Apparently in this case the chlorine was used for odor control. In 1929, Bell (*4*) added bleaching powder to the return sludge at Barnsley, England, at an average rate of 22 p. p. m. available chlorine, and stated that it "has been found very useful in restricting the amount of septic matter returned to the aeration tank." Gascoigne (*5*) in 1931 reported the use in Canada of bleaching powder applied to return activated sludge to correct disturbances in the process. Heukelekian (*6*) in 1931 reported increased turbidity in the supernatant liquor due to sterilization of activated sludge with chlorine.

Chlorination of sewage entering activated sludge plants has been tried by many investigators with widely varying results. Goudey (*7*) in 1932 reported that, at Pasadena, prechlorination tended to cause bulking.

The Committee on Sewage Disposal of the American Public Health Association (*10*) reported in 1933 that, "although chlorine has been tried by several investigators in an effort to control bulking of activated sludge, there are as many negative as positive results. Hence, its value for this purpose remains unproven."

EXPERIMENTAL STUDY

Two methods of approach to the problem of fungus growth control seemed feasible. These were (1) isolation of the organism in pure culture and determination of its growth requirements and possible elimination of essential foods or environmental conditions, and (2) addition of some material in a concentration toxic to the fungus but not to the other microscopic organisms normal to proper functioning activated sludge.

The first of these procedures has thus far not been successful. The fungus has been grown in pure culture, but our efforts to reinoculate it into sewage have failed. Attention was therefore directed to the second method of control. Fungus-laden, aerated sludge was treated, first in 1-liter glass graduates and later in 8-liter bottles in which aeration was provided, with one of a number of toxic materials in varying amounts, and these mixtures were examined under the microscope after definite intervals of time to observe the effect of the chemicals on the fungus strands, as well as upon the other forms of plankton. Phenol, lime, copper sulphate, iron salts, alum, sulphur, silica gel, activated carbon, sodium sulphite, and chlorine were among the chemicals employed. The most consistently favorable results were obtained with chlorine, which, if added in proper proportion, appeared to shrivel the protruding strands of fungus but did not destroy the normal plankton associated with the sludge floc.

Based on these observations, tests were continued on a larger scale in the experimental activated sludge treatment plant when bulking of sludge was experienced. This unit had been operated for several days previous to August 28, 1934, on the fill and draw method. The sludge was in such condition that, after 90 minutes settling, the sludge blanket was only 3 inches below the surface and fungus growths in the floc particles were very abundant. On that date chlorine to the amount of 22.5 p. p. m. was added to the sludge-sewage mixture in the aeration tank and after an interval of 1½ hours' standing, observations indicated that the fungus was adversely affected but that other plankton, except stalked ciliates, remained active. After reseeding with sewage-sludge liquor from another unit to the extent of 4 percent of the tank volume, operation was resumed. The sludge index, $\frac{\text{suspended solids in p. p. m.}}{\text{settleable solids in cc per liter}}$, increased from 2.1 to 10.4 by this treatment and continued to improve, reaching 16.3 by September 10, 1934.

Following these favorable results the suggestion was made to Mr. E. E. Smith, in charge of the Lima (Ohio) activated sludge plant, that the application of chlorine might be of value in retarding the growth of fungus in the activated sludge and thereby improve the bulking condition being experienced. Favorable results were obtained as recorded by Mr. Smith (*12*), and chlorination has since constituted an integral part of the treatment at that plant. Mr. Smith, however, made one noted change in the treatment in that he introduced the chlorine into the return sludge and in smaller amounts than had been attempted before.

During the past year chlorine has been frequently used to reduce fungus growths in activated sludge at this station, using Mr. Smith's method of applying small amounts to the return sludge. Results,

insofar as fungus control is concerned, were uniformly successful. An improvement in the settling of the floc was always obtained if fungus was present, but if the bulking of the sludge was due in any great degree to the presence of a light, diffuse floc, the improvement was not always sufficient to insure satisfactory operation of the plant. Observations pertinent to these experiments are given in table 1, which lists the conditions at the start, the average amount of chlorine used, and its effect as shown by the sludge condition at the end of the experiment.

TABLE 1.—*Experiments showing the effect of chlorine in control of sludge bulking resulting from fungus laden sludge floc*

Experiment no.	Date	Average amount of chlorine used		Sludge index	Sludge blanket, percent of settling tank water depth	Effluent, suspended solids, p. p. m.	Amount of fungus present	Floc condition
		P. p. m., return sludge	Percent of return sludge dry solids					
1	Dec. 3, 1934	3.46		4.3	100	149	Moderate	Amoeboid, ragged.
	Dec. 9, 1934	0		5.3	89	128	Small	Ragged.
	Dec. 17, 1934			8.8	99	170	do	Do.
2	Dec. 17, 1934	1.52		8.8	99	170	Small	Ragged.
	Jan. 7, 1935	0		10.1	14	18	0	Granular, amoeboid.
	Jan. 29, 1935			5.6	95	172	Trace	Ragged.
3	Mar. 27, 1935	1.37	0.04	1.8	100	312	Moderately abundant.	Spongy, ragged.
	May 14, 1935			2.4	39	10	Small	Do.
4	June 6, 1935	2.12	.04	1.8	79	108	Moderately abundant.	Ragged.
	June 17, 1935			2.6	17	26	Small	Spongy, ragged.
5	June 24, 1935	1.68	.03	4.9	(1)	12	0 to trace	Amoeboid.
	July 17, 1935			5.1	(1)	8	Trace	Spongy, ragged.
6	Sept. 21, 1935	.467	.007	3.8	90	26	Large	Large, ragged, dense.
	Oct. 15, 1935	0	0	10.0	26	12	Moderate	Do.
	Oct. 25, 1935			5.0	84	57	Large	Do.
7	Oct. 26, 1935	.620	.008	5.4	78	29	Large	Large, ragged, dense.
	Nov. 5, 1935			13.9	13	8	Moderate	Large, amoeboid.

[1] Less than 13.

These results plainly show that chlorine applied in small amounts to the return sludge reduced fungus growths and so effected an improvement in the sludge. Except in experiment 5 there was a noticeable improvement in the settling of the sludge in the final clarifier, the sludge blanket level dropped, the effluent improved, and the sludge index rose. Experiments 1, 2, and 6 indicate clearly how plant operation improved with the use of chlorine and how, with cessation of chlorination, after an interval, bulking again recurred with attendant operating difficulties. Experiments 1 to 5, inclusive, also

show clearly that although chlorine reduced the interference with proper settling caused by fungus filaments, this treatment did not cause the floc particles to coagulate and did not aid in controlling the bulking that is due to small, light floc particles of comparatively low specific gravity.

Experiments 6 and 7 were made with intermittent, instead of continuous, chlorination of the return sludge. The chlorine dosages were much lighter than those in the other experiments, but were apparently effective in destroying the fungus filaments. These two experiments show the remarkable improvement in sludge settling due to the action of chlorine on fungus filaments attached to large, dense flocs. Experiment 6 also shows the rapid decrease in settling rate of the sludge due to increased fungus growth when chlorination was suspended.

Tables 2 and 3 give daily results for experiments 4 and 6, respectively. It is interesting to note that in experiment 4, when the chlorine dosage was about 2.5 p. p. m., or 0.05 percent on a dry solids basis, the sludge settling improved, but when the dosage dropped to 1.7 p. p. m. or less (about 0.03 percent of the dry solids) the settling deteriorated. In experiment 6, however, chlorine in the amount of 0.7 p. p. m., or 0.01 percent of the dry solids, was ample to effect a marked improvement in the settling. The difference may be due to the marked dissimilarity in the two flocs.

TABLE 2.—*Detailed observations of chlorine treatment of bulking sludge*

EXPERIMENT NO. 4

Date	Chlorine used		Sludge index	Sludge blanket, percent of settling-tank water depth	Effluent, suspended solids, p. p. m.	Amount of fungus present
	P. p. m., return sludge	Percent of return sludge dry solids				
1935						
June 6	2.02	0.04	1.8	79	108	Moderately abundant.
June 7	2.73	.06	1.6	67	34	Do.
June 8	2.73	.05	1.9	53	10	Do.
June 9	2.59	.05	2.5	44	10	
June 10	2.74	.05	2.1	40	4	Moderately abundant.
June 11	2.57	.04	2.8	40	5	Do.
June 12	1.60	.03	2.4	82	18	Small.
June 13	1.70	.03	2.6	91	120	Do.
June 14	1.60	.03	2.5	92	92	Moderate.
June 15	1.80	.03	3.3	60	28	Do.
June 16	1.79	.03	3.0	13	28	
June 17	1.60	.03	2.6	17	26	Small.

NOTE.—After June 15, not enough sewage to supply plant. Trouble in street sewer.

In November 1935 an opportunity was provided to test the use of chlorine for reduction of fungus growths in routine plant operation. The city of Lancaster, Pa., had experienced much trouble with bulking activated sludge at its South Plant and requested aid from the United States Public Health Service in solving the problem.

After investigation of plant arrangement and conditions, the trial use of chlorine was recommended. The floc was large, very diffuse, and apparently loosely bound together with fungus filaments which were present in large amount. Although it was realized that chlorine

TABLE 3.—*Detailed observations of chlorine treatment of bulking sludge*

EXPERIMENT NO. 6

Date	Chlorine used		Sludge index	Sludge blanket, percent of settling tank water depth	Effluent, suspended solids, p. p. m.	Amount of fungus present
	P. p. m., return sludge	Percent of return sludge dry solids				
1935						
Sept. 21	0.419	0.0078	3.8	90	26	
Sept. 22	.419	.0078		94	26	
Sept. 23	.419	.0077	4.3	74	31	
Sept. 24	.419	.0076	4.2	73	17	
Sept. 25	.419	.0070	4.6	73	17	
Sept. 26	.429	.0083	4.5	70	15	
Sept. 27	.429	.0067		63	29	
Sept. 28	.402	.0060	6.0	48	15	
Sept. 29	.402	.0060		52	15	
Sept. 30	.402	.0067	6.0	47	11	
Oct. 1	.402	.0068	4.7	50	17	Noticeable decrease.
Oct. 2	.402	.0062	6.1	54	13	
Oct. 3	.402	.0054	6.1	57	19	Large.
Oct. 4	.402	.0057	6.3	51	12	
Oct. 5	.402	.0042	6.6	58	18	
Oct. 6	.402	.0042		42	18	
Oct. 7	.402	.0055	7.0	68	21	Moderate.
Oct. 8	.402	.0057	6.1	85	46	Do.
Oct. 9	.618	.0095	4.4	90	49	Do.
Oct. 10	.690	.0112	5.4	50	15	Do.
Oct. 11	.690	.0106	5.7	57	16	Do.
Oct. 12	.690	.0098	6.4	48	17	Abundant.
Oct. 13	.690	.0098		34	17	
Oct. 14	.690	.0123	8.6	26	11	
Oct. 15	.690	.0099	10.0	15	12	Moderate.
Oct. 16	0	0	10.4	15	13	Moderately abundant.
Oct. 17	0	0	10.2	50	15	
Oct. 18	0	0	11.6	25	12	Small.
Oct. 19	0	0	10.6	34	13	Moderately abundant.
Oct. 20	0	0		38	13	
Oct. 21	0	0	8.7	35	11	
Oct. 22	0	0	9.4	25	11	Moderately abundant.
Oct. 23	0	0	8.5	31	13	Do.
Oct. 24	0	0		59	16	Large.
Oct. 25	0	0	5.0	85	57	Do.

would not overcome the diffuseness of the floc, it was felt that reduction in the amount of fungus would cause some improvement in the settling of the sludge. The return sludge was chlorinated for 4 days (Nov. 22 to Nov. 26) at the rate of 4.57 p. p. m., or 0.11 percent of the dry solids. When chlorination was stopped, the amount of fungus had been greatly reduced and the stalked ciliates, chiefly *epistylis*, were beginning to show the effect of the chlorine. During the chlorination of the sludge an unexpected and interesting increase of turbidity of the effluent occurred. The chlorine apparently destroyed some of the fungus strands that had previously loosely held the floc material together. The average size of the floc decreased and considerable very fine floc material, much of it nearly colloidal, appeared in the effluent. Before chlorination was stopped, much of this loosened material had washed out of the floc and the effluent was beginning to clear. After chlorination had been stopped, the turbidity continued to decrease.

Since November 26, chlorine has been used regularly, but in smaller amounts, to prevent excessive growths of fungus. At the end of the year, December 31, 1935, the treatment was continuing successful, the sludge was settling reasonably well, and the final effluent contained about 10 p. p. m. suspended solids.

CONCLUSIONS

Frequent, periodic examination of the sludge floc in a cell under a low-power microscope is essential to obtain proper information concerning the condition of the sludge floc in its natural condition.

Bulking of activated sludge may be caused by diffuse floc structure, fungus growth, or a combination of both.

Chlorination of the return sludge at low rates is a useful method for combating bulking due primarily to fungus growth. Results indicate that the proper rate of chlorination lies between either 0.7 and 7.0 p. p. m. of return sludge, or 0.01 percent and 0.1 percent of the weight of dry solids, depending upon the character of the sludge floc.

Chlorination is not successful against that type of bulking due to light, diffuse floc.

Chlorination of an activated sludge is attended by the serious danger of overchlorinating and destroying the desirable plankton growths. The margin of safety is small and use of the method requires constant careful supervision.

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ACUTE RESPONSE OF GUINEA PIGS TO VAPORS OF SOME NEW COMMERCIAL ORGANIC COMPOUNDS

X. HEXANONE (METHYL BUTYL KETONE)[1]

By H. H. Schrenk,[2] W. P. Yant,[3] and F. A. Patty[4]

This report on the acute response of guinea pigs to hexanone (methyl butyl ketone) vapor in air, is the tenth of a series of similar reports[5] which deal with studies pertinent to establishing a criterion of the toxicity of some chemical products that have recently reached or promise to reach important domestic or industrial use.

The investigation was undertaken at the request of Stanco, Inc., and was conducted jointly by the United States Bureau of Mines and that company. The experiments were conducted by the Bureau of Mines at its Pittsburgh Experiment Station.

SCOPE OF WORK

The scope of the work included a study of the toxicity and physiological response of guinea pigs exposed to vapors of hexanone (methyl butyl ketone). Only acute effects as produced by a single exposure were studied. The experiments were planned to cover a range of concentrations and periods of exposure which produce no response or but slight response, moderate response, and serious response.

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[1] Contribution from the Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa., published by permission of the Director, U. S. Bureau of Mines. Work on manuscript completed May 18, 1935.

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[4] Associate chemist, health laboratory section, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.

[5] Acute response of guinea pigs to vapors of some new commercial organic compounds:

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CHEMICAL AND PHYSICAL PROPERTIES

The hexanone used in this study was a commercial grade of methyl butyl ketone sold for industrial use. It was water clear and had an odor resembling acetone, though somewhat more pungent. A determination of the specific gravity and boiling range of this material gave the following results:

Specific gravity

15.6°/15.6° C	0.8167
20°/15.6° C	.8132

Boiling range

Distillate, cumulative (percent)	Temperature ° C., corrected to 760 mm	Distillate, cumulative (percent)	Temperature ° C., corrected to 760 mm
Initial boiling point	120.1	60	127.3
1	122.6	70	127.4
2	123.6	80	127.7
5	125.1	90	128.2
10	126.1	95	128.8
15	126.3	98	129.4
20	126.5	99	130.0
30	126.7	99.5	133.2
40	126.9	99.7	137.2
50	127.0		

Recovery, 99.7 percent; residue, 0.2 percent; lost, 0.1 percent.

These values agree closely with the specifications furnished by the manufacturer for this commercial product. The manufacturer also specified the product to be 86.8 percent ketone as determined by acetylation.

The boiling point of hexanone as given in the International Critical Tables [6] is 127.2° C.

SUGGESTED USES OF HEXANONE [7]

Hexanone is an organic solvent. It is reported to be a good solvent for nitrocellulose and Vinilite products, and has possibilities of use in making lacquers and also varnish and lacquer removers.

TEST APPARATUS

The apparatus for preparing hexanone-air mixtures and for exposing animals was the same as that described in a previous report dealing with butanone.[8]

[6] International Critical Tables, first edition, 1926, vol. 1, p. 202.

[7] These suggestions are given for the purpose of acquainting persons interested in industrial hygiene with the probable fields of use of this product. The Bureau of Mines has done no work on the use of this product and these suggested uses are not intended to be complete.

[8] See footnote 5.

COMPUTATION AND ANALYSIS OF VAPOR-AIR MIXTURES

The method of computation and analysis is the same as that described in the report on butanone.[8] Table 1 gives the results of analyses of a standard aqueous solution of hexanone made to check the accuracy of the method of analysis.

TABLE 1.—*Results of the analysis of portions of a standard aqueous solution of hexanone*

Hexanone taken	Hexanone found by analysis	Recovery
Milligrams	*Milligrams*	*Percent*
16.35	16.59	101.5
24.33	23.51	97.3
32.55	31.40	96.5
40.65	39.36	97.0

Excepting the smallest sample (16 mg) in table 1, an average recovery of 97 percent was obtained. The values obtained for the amount of hexanone in the vapor-air mixtures used in animal exposures (table 2) were corrected by multiplying the determined value by 100/97, or 103.

Table 2 gives the values for the concentrations as computed from the volume of air and amount of hexanone vaporized, and the concentrations found by chemical analysis of vapor-air mixtures used in animal experiments. The calculation of the percent by volume was made on the basis that one gram molecular weight of hexanone is equivalent to 22.4 liters of vapor at 0° C. and 760 mm mercury pressure.

TABLE 2.—*Results of analysis of atmospheres used for exposing animals* [1]

Concentration by—		Concentration by—	
Computation	Analysis	Computation	Analysis
(2)	1.8	0.23	0.21
(2)	1.9	0.22	.24
(2)	2.0	0.21	.24
(2)	2.0	0.22	.23
(2)	[3] 1.9	0.21	.22
(2)	[3] 2.2	0.10	.08
0.67	.67	0.10	.12
0.66	.65	0.10	.11
0.63	.58	0.09	.10
0.65	.66		

[1] Concentrations in percent by volume at 25° C. and 760 mm pressure. To convert to mg per liter, multiply by 40.9.
[2] Concentration obtained by recirculating air in a closed chamber at 30° C and 740 mm pressure across wicks wet with hexanone; no computed concentration.
[3] Obtained by adsorption on air-equilibrated charcoal.

The maximum concentration attainable by recirculating air at 30° C. and 740 mm pressure over large-surface wicks wet with hexanone averaged approximately 2 percent. The remainder of the

[8] See footnote 5.

results in table 2 represent experimental atmospheres prepared by continuously volatilizing a measured amount of hexanone in a measured volume of air.

With the exception of experiments with approximately 2.0 percent concentrations in which the air was recirculated in order to create a maximum vapor concentration the number of air changes in the experimental chamber was always 2 to 3 per hour. Tests have shown that this rate of change in the apparatus used is ample to prevent oxygen deficiency or significant increase in carbon dioxide. The general order of concentrations used in the experiments were 2.0, 0.65, 0.23, and 0.10 percent by volume.

TEST PROCEDURE; DESCRIPTION AND CARE OF ANIMALS

The test procedure and description and care of animals were the same as described in the report on butanone.[9]

RESULTS OF TESTS

This report presents summarized results pertinent to signs or objective symptoms, fatality, and gross pathology.

OBJECTIVE SYMPTOMS

Control animals.—No signs or symptoms were exhibited by the 18 control guinea pigs taken at random from the stock animals used in these tests. No deaths occurred.

Exposed animals.—The signs or symptoms exhibited by animals exposed to hexanone vapor in the order of their occurrence were as follows: Irritation of the nose and eyes manifested by rubbing nose with the forepaws and squinting; lacrimation; incoordination; narcosis; gasping-type respiration; and death. Table 3 gives the average time necessary to produce these symptoms by various concentrations of hexanone vapor in air. The figures given indicate the average time for occurrence of the sign or symptom, excepting those in parentheses, which indicate that the particular symptom did not occur in the maximum period of exposure as given.

TABLE 3.—*Signs and symptoms produced in guinea pigs exposed to vapors of hexanone*

Type of symptom	Concentration of vapor in percent by volume			
	2.0	0.65	0.23	0.1
	Duration of exposure (minutes)			
Nasal irritation (rubbing nose)	[1]	[1]	1	1
Eye irritation (squinting)	[1]	[1]	1	30
Lacrimation	[1]	1	10	30
Incoordination	5–10	20–30	90	[2] (810)
Narcosis (unconsciousness)	20–30	90–120	[2] (810)	[2] (810)
Respiratory changes, dyspnea, gasping	30–60	240–540	[2] (810)	[2] (810)
Death	70	540	[2] (810)	[2] (810)

[1] Occurred almost immediately after start of exposure.
[2] Not observed in the maximum exposure time given in parentheses.

[9] See footnote 5.

No abnormal signs were observed during or following an exposure to 0.1 percent hexanone vapor in air by volume for 810 minutes. With exposure to 0.23 percent in air, signs of irritation of the nose and eyes occurred in one minute, lacrimation in 10 minutes, incoordination in 90 minutes, but no narcosis nor respiratory changes were observed and no deaths occurred during or following an exposure of 810 minutes. The time for the occurrence of these symptoms decreased rapidly with increases in concentration, and death was produced by an exposure to 0.65 and 2.0 percent vapor in air for 540 and 70 minutes, respectively.

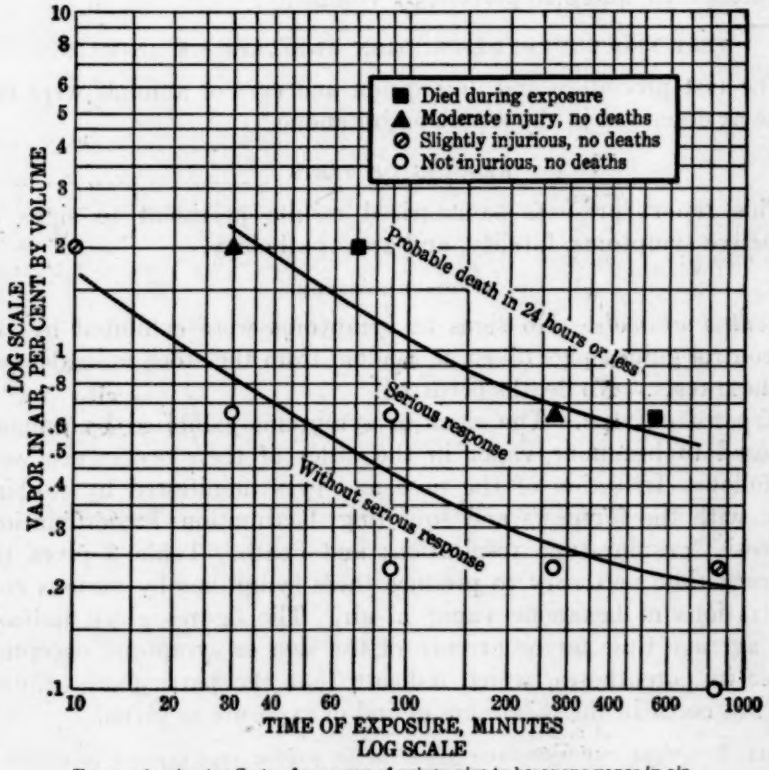

FIGURE 1.—Acute effects of exposure of guinea pigs to hexanone vapor in air.

GROSS PATHOLOGY

Control animals.—The 18 control animals killed for autopsy exhibited no significant gross pathology.

Exposed animals.—The gross pathological findings in animals that died during exposure (see table 3 and fig. 1) were slight congestion of the brain and moderate to marked congestion of the systemic organs. The lungs were moderately congested and emphysematous. Exposure to conditions that caused marked incoordination, narcosis, and a gasping-type respiration (2 percent for 30 minutes, 0.65 percent

for 270 minutes) produced a slight congestion of the brain, with moderate congestion of the lungs, liver, and kidneys in animals killed immediately after exposure; but these findings were absent in animals killed for autopsy 4 to 8 days following exposure. No gross pathology was observed in animals exposed to 0.23 percent for 90 and 270 minutes or to 0.1 percent for 810 minutes.

SUMMARY OF FATALITY AND PHYSIOLOGICAL RESPONSE

The fatality and summary of the response of guinea pigs exposed to hexanone vapor in air is shown graphically in figure 1 and given in conventional degrees of response in table 4. The results of each experiment are designated by a symbol which represents one of four different degrees of severity. The symbols represent the most severe response for a majority, or at least three of a group of six animals exposed to a given condition. The response of none of the animals deviated markedly from that which is representative of the group.

The four degrees of response are given in the legend on figure 1. In addition to representing the response of each group by symbols, the symbols have been separated into three general fields or zones of probable response.

Table 4 gives the concentrations (obtained by direct experiment or extrapolated from table 3 and fig. 1) which produce the degrees of response generally reported in the literature dealing with noxious gases. These data may be compared with toxicological data for other compounds.[10] [11] [12] [13] [14] [15]

TABLE 4.—*Acute effects of exposure of guinea pigs to hexanone vapor in air*

Acute effects of exposure after various periods of time	Concentration, percent by volume in air
Kills in a few minutes	[1]
Dangerous to life in 30 to 60 minutes	1.0–2.0
Dangerous to life after several hours	0.4–0.6
Maximum amount for 60 minutes without serious disturbance	[2] 0.3
Maximum amount for several hours without serious disturbance	0.15
Maximum amount for several hours with but slight or no symptoms	[3] 0.1

[1] Not produced by 2 percent, the highest concentration obtained in a closed chamber by extended recirculation of air (30° C., 740 mm pressure) over wicks wet with hexanone.
[2] This concentration was found to be very irritating to human beings even for short exposures.
[3] This concentration was found by human beings to have a strong odor and moderate eye and nasal irritation, although no definite reaction was noted in guinea pigs even after 810 minutes' exposure.

[10] See footnote 5.
[11] Sayers, R. R., Yant, W. P., Thomas, B. G. H., and Berger, L. B.: Physiological response attending exposure to methyl bromide, methyl chloride, ethyl bromide, and ethyl chloride. Pub. Health Bull. 185 (1929).
[12] International Critical Tables, first edition (1927), vol. 2, 318; also see errata sheet, vol. 2.
[13] Henderson, Y., and Haggard, H. W.: Noxious gases. Am. Chem. Soc. Monograph No. 35, Chemical Catalog Co., New York. (1927.)
[14] Flury, F., and Zernik, F.: Schädliche Gase. Berlin. Published by Julius Springer. (1931.)
[15] Fieldner, A. C., Katz, S. H., and Kinney, S. P.: Gas masks for gases met in fighting fires. U. S. Bureau of Mines Technical paper 248. (1921.)

CAUSE OF DEATH

Death apparently was due to a state of narcosis which terminated in death, rather than to the irritation of the lungs. No animals died following exposure. They either died during exposure or survived the exposure and the 4- or 8-day post-exposure observation period. In some instances the animals were unconscious several hours after termination of exposure (to 2 percent for 30 minutes and 0.65 percent vapor for 270 minutes), but appeared normal 24 hours after exposure.

COMPARISON OF ACUTE TOXICITY OF BUTANONE, PENTANONE, AND HEXANONE

The acute toxicity of hexanone as indicated by exposure of guinea pigs is approximately twice that of pentanone and five times that of butanone.[16] Owing to its lower volatility, however, the maximum concentration obtained with hexanone was only about half that obtained with pentanone and one-fifth that obtained with butanone. This increase in toxicity with increase in molecular weight in the series is another interesting illustration of the relationship between chemical constitution and physiological action. From a practical viewpoint the lower volatility would, under similar conditions of usage, tend to compensate for the higher toxicity.

WARNING PROPERTIES AND HAZARDS OF ACUTE POISONING

Men exposed to 0.23, 0.65, and 2.0 percent vapor in air pronounced the atmosphere extremely disagreeable even for a short time (one-fourth to 1 minute) because of strong odor and irritation to eyes and nasal passages. One-tenth of 1 percent was found to have a strong odor and moderate eye and nasal irritation. Concentrations producing no marked symptoms and apparently harmless to guinea pigs after one exposure of several hours have distinct warning properties of both odor and irritation that are very disagreeable to human beings.

WARNING PROPERTIES AND EXPLOSION HAZARDS

The explosive hazard of hexanone is minimized by the distinct warning properties of concentrations below the inflammable range but cannot be ignored. A few determinations of the inflammable properties of the vapor of the hexanone used in this study indicated the limits to be approximately 1.2 (lower) to 8.0 percent (upper) by volume.

SUMMARY AND CONCLUSIONS

The acute physiological response of guinea pigs to air containing hexanone (methyl butyl ketone) vapor was determined. The concentrations of the vapor ranged from those that produced death to

[16] See footnote 5.

those that produced no effect after several hours' exposure. The signs of response, fatality, and gross pathology are given. The warning properties as studied by the exposure of persons are described.

1. Hexanone produces narcosis, terminating in death in the higher concentrations. Symptoms are principally eye and nasal irritation, followed by narcosis. Animals that did not die during exposure, recovered.

2. The principal gross pathological findings were congestion and hemorrhage of the lungs, slight congestion of the brain, and moderate congestion of the liver and kidneys, as observed in the autopsies performed immediately after exposure.

3. At room temperature it was not possible to attain a concentration that would kill in a few minutes. Exposure to 1 to 2 percent vapor is considered dangerous to life of guinea pigs after 30 to 60 minutes; 0.4 to 0.6 dangerous to life after several hours; and 0.15 the maximum amount to which guinea pigs may be exposed for several hours without serious disturbance.

4. The commercial hexanone used in the experiments had a distinct odor and was moderately irritating to the nose and eyes of human beings in a concentration (0.1 percent) found to be apparently harmless to guinea pigs after several hours' exposure. The approximate inflammable limits are 1.2 (lower) and 8 percent (upper) by volume in air. The inflammable range is extremely disagreeable to human beings from the standpoint of odor and eye and nasal irritation.

ACKNOWLEDGMENTS

Acknowledgment, with thanks, is made to Surgeon R. R. Sayers, United States Public Health Service, formerly Chief of the Health and Safety Branch, United States Bureau of Mines, for consultation and advice in this investigation, and to John Chornyak, formerly medical officer in charge of the pathological laboratory, and S. H. Black, formerly assistant surgeon, United States Bureau of Mines, for making the pathological examinations.

FOOT DEFECTIVENESS IN SCHOOL CHILDREN[1]

Results of the Examination of 282 School Children, Mostly Colored, in New York City

Reported by MAURICE J. LEWI, M. D., *President, The Foot Clinics of New York*

Through the cooperation of Dr. A. L. Aldinger, director of health education of the city of New York, and his staff, a foot survey of 282 school children, mostly colored, was conducted by staff members of The Foot Clinics of New York, under the direction of Otto F.

[1] For earlier reports on foot defectiveness in school children of New York City, see the Public Health Reports for Nov. 4, 1921, pp. 2725-2727, and Mar. 27, 1925, pp. 605-609.

Schuster, assisted by George A. Smith, Jr. The examining group consisted of three orthopedic surgeons and nine podiatrists. The age of the pupils examined ranged from 7 to 14 years.

As in previous surveys, it was noted that postural defects accompanied mechanical defects, especially weak-foot conditions. The percentage of mechanical defects found in boys was approximately the same as that in previous surveys. It is interesting to note that, in this group, the percentage of mechanical defects in girls, which is usually greater by from 10 to 15 percent, was surprisingly low in this school. This is rather an unusual phenomenon and may be attributed to the fact that 95 percent of the children examined were colored, whereas in previous surveys made by this institute the children examined were either all white or predominantly white. Most of the deviations from the normal were of a character that would permit of correction if properly treated.

Foot defects found among 282 school children (mostly colored) in New York City, 1936

[Boys, 67; girls, 215]

Defect		Boys	Girls
Improper mode of walking	percent	34	32
Defective posture	do	37	25
Improper foot gear	do	58	61
Superficial defects	do	33	32
Weak foot	do	69	57
Functionally impaired anterior metatarsal arch	do	32	33
Hallux valgus [1]	do	0	33

[1] Including all minor deflections of the great toe.

DEATHS DURING WEEK ENDED APRIL 25, 1936

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 25, 1936	Corresponding week, 1935
Data from 86 large cities of the United States:		
Total deaths	9,302	9,014
Deaths per 1,000 population, annual basis	13.0	12.6
Deaths under 1 year of age	612	606
Deaths under 1 year of age per 1,000 estimated live births	55	56
Deaths per 1,000 population, annual basis, first 17 weeks of year	13.6	12.6
Data from industrial insurance companies:		
Policies in force	68,464,868	67,826,175
Number of death claims	14,880	14,265
Death claims per 1,000 policies in force, annual rate	11.4	11.0
Death claims per 1,000 policies, first 17 weeks of year, annual rate	10.9	10.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended May 2, 1936, and May 4, 1935

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 2, 1936, and May 4, 1935

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935
New England States:								
Maine	1	2	3	3	210	176	0	0
New Hampshire	----	1	----	1	80	----	0	0
Vermont	----	----	----	----	595	41	0	0
Massachusetts	5	8	----	----	1,460	427	5	4
Rhode Island	----	----	----	----	36	518	1	1
Connecticut	5	2	1	5	167	1,493	2	0
Middle Atlantic States:								
New York	44	23	[1] 7	[1] 3	2,825	3,149	20	24
New Jersey	12	26	12	16	393	1,908	3	5
Pennsylvania	40	36	----	----	1,135	4,283	20	9
East North Central States:								
Ohio	31	16	129	6	827	1,808	29	6
Indiana	5	11	64	34	17	467	4	7
Illinois	32	47	68	26	33	2,322	18	29
Michigan	11	15	9	2	90	6,587	4	2
Wisconsin	5	3	63	32	116	1,727	2	1
West North Central States:								
Minnesota	2	7	2	1	550	597	4	2
Iowa	2	5	15	91	7	665	2	5
Missouri	----	29	247	31	20	528	3	14
North Dakota	1	2	3	5	2	30	0	1
South Dakota	4	4	3	2	6	67	0	0
Nebraska	3	5	----	2	32	373	1	2
Kansas	1	14	22	15	20	1,136	1	1
South Atlantic States:								
Delaware	1	1	----	----	24	4	0	0
Maryland [2]	6	8	10	4	342	77	14	9
District of Columbia	7	7	3	----	126	60	8	9
Virginia	17	13	235	----	132	509	8	7
West Virginia	11	10	59	35	66	390	9	11
North Carolina	9	12	30	21	48	341	4	0
South Carolina	4	2	223	142	63	29	7	0
Georgia [2]	10	2	----	----	----	----	3	0
Florida	2	4	19	5	21	28	4	0
East South Central States:								
Kentucky	4	10	119	9	75	450	31	0
Tennessee	7	13	298	35	58	41	7	7
Alabama [2]	11	19	223	35	20	175	3	1
Mississippi [2]	5	5	----	----	----	----	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 2, 1936, and May 4, 1935—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935
West South Central States:								
Arkansas	11	2	146	16	1	60	0	3
Louisiana	8	19	46	1	52	70	7	0
Oklahoma [4]	8	1	215	60	25	194	5	0
Texas [3]	30	34	741	146	584	68	6	1
Mountain States:								
Montana [3]	3	6	18	41	17	445	0	1
Idaho			1		29	6	1	0
Wyoming [3]	1	2			2	27	0	0
Colorado	2	5			41	247	0	1
New Mexico	3	6	3		38	31	0	0
Arizona	6	1	59	10	212	20	2	0
Utah [3]		1			36	7	1	0
Pacific States:								
Washington	1	2	8		399	439	2	3
Oregon [3]		4	48	22	210	264	0	2
California	29	25	148	48	2,217	1,595	4	7
Total	400	470	3,300	905	13,129	33,879	246	175
First 18 weeks of year	10,159	11,999	129,988	98,034	167,826	490,633	4,322	2,487

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935
New England States:								
Maine	0	0	18	5	0	0	0	0
New Hampshire	0	0	8	23	0	0	0	0
Vermont	0	0	5	9	0	1	0	0
Massachusetts	0	1	251	210	0	0	0	4
Rhode Island	0	0	18	9	0	0	0	1
Connecticut	0	1	50	90	0	0	2	1
Middle Atlantic States:								
New York	2	0	910	961	0	0	14	3
New Jersey	0	0	460	164	0	0	6	3
Pennsylvania	1	0	460	590	0	0	16	8
East North Central States:								
Ohio	1	0	674	731	0	0	21	3
Indiana	0	0	178	131	1	0	1	0
Illinois	0	1	684	1,269	7	0	1	4
Michigan	0	1	328	331	1	1	6	5
Wisconsin	0	0	574	427	11	16	1	0
West North Central States:								
Minnesota	0	2	306	413	7	5	0	0
Iowa	0	0	248	91	37	0	0	0
Missouri	0	1	274	64	11	0	2	0
North Dakota	0	0	30	126	4	0	1	0
South Dakota	0	0	70	13	23	11	1	0
Nebraska	0	0	149	57	17	35	0	1
Kansas	2	0	373	75	42	36	0	3
South Atlantic States:								
Delaware	0	0	4	5	0	0	0	1
Maryland [2]	0	1	72	123	0	0	2	1
District of Columbia	0	0	23	78	0	0	1	0
Virginia	2	1	72	36	0	0	3	5
West Virginia	0	0	46	64	0	0	7	5
North Carolina	0	2	17	9	0	0	0	4
South Carolina	1	0	1	7	0	2	3	4
Georgia [3]	0	0	16		0	0	7	11
Florida	1	0	6	4	0	0	2	5
East South Central States:								
Kentucky	0	0	28	33	0	1	4	15
Tennessee	0	1	23	19	0	0	5	2
Alabama [3]	0	0	4	6	1	0	2	3
Mississippi [3]	0	0	4	7	0	0	1	5

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 2, 1936, and May 4, 1935—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935	Week ended May 2, 1936	Week ended May 4, 1935
West South Central States:								
Arkansas	0	1	3	2	0	2	1	2
Louisiana	0	2	13	17	0	0	5	15
Oklahoma [4]	0	0	54	13	1	3	1	6
Texas [3]	1	0	85	39	1	7	10	5
Mountain States:								
Montana [5]	0	0	87	10	8	4	0	0
Idaho	0	0	19	4	0	0	0	0
Wyoming [5]	0	0	47	37	8	17	0	0
Colorado	0	0	93	251	2	5	0	0
New Mexico	0	1	51	10	0	6	0	0
Arizona	0	0	18	51	0	0	0	1
Utah [3]	0	0	57	129	2	0	0	0
Pacific States:								
Washington	0	2	82	61	10	57	1	1
Oregon [5]	0	0	26	-------	26	9	0	1
California	0	3	276	199	6	21	5	4
Total	11	21	7,295	7,003	226	239	132	138
First 18 weeks of year	316	430	138,534	129,474	4,124	3,457	2,096	2,394

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever; week ended May 2, 1936, 17 cases, as follows: Georgia, 1; Alabama, 2; Texas, 14.
[4] Exclusive of Oklahoma City and Tulsa.
[5] Rocky Mountain spotted fever, week ended May 2, 1936, 9 cases, as follows: Montana, 6; Wyoming, 2; Oregon, 1.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following reports of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1936										
Puerto Rico	-------	59	43	1,191	14	1	0	-------	0	30
March 1936										
Montana	4	8	121	-------	66	-------	0	522	43	3
April 1936										
Arkansas	7	30	2,327	77	18	25	1	44	1	4
Delaware	1	7	-------	-------	81	-------	0	25	0	1
Nebraska	3	26	5	-------	241	-------	0	642	91	0

February 1936

Puerto Rico:	Cases
Chicken pox	18
Dysentery	7
Leprosy	2
Mumps	45
Ophthalmia neonatorum	7
Tetanus	18
Tetanus, infantile	5
Whooping cough	48

March 1936

Montana:	Cases
Chicken pox	88
German measles	7

March 1936—Continued

Montana—Continued.	Cases
Impetigo contagiosa	2
Mumps	578
Septic sore throat	7
Vincent's infection	2
Whooping cough	36

April 1936

Chicken pox:	
Arkansas	76
Delaware	55
Nebraska	161

April 1936—Continued

German measles:	Cases
Delaware	7
Mumps:	
Arkansas	272
Delaware	140
Nebraska	192
Septic sore throat:	
Nebraska	9
Whooping cough:	
Delaware	61
Nebraska	32

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 25, 1936

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0	------	0	0	3	2	0	0	0	0	28
New Hampshire:											
Concord	0	------	0	0	1	0	0	1	0	0	7
Manchester	0	------	2	3	0	4	0	0	0	0	18
Nashua	0	------	--------	25	------	0	0	-------	0	0	--------
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	63	0	0	0	0	0	3	24
Rutland	0	------	0	78	0	0	0	0	0	0	11
Massachusetts:											
Boston	3	------	1	423	32	79	0	14	0	20	252
Fall River	0	------	0	2	2	16	0	1	0	0	23
Springfield	0	------	0	2	0	6	0	0	0	1	32
Worcester	0	------	0	51	10	8	0	3	0	2	67
Rhode Island:											
Pawtucket	------	------	------	------	------	------	------	------	------	------	------
Providence	0	------	1	27	6	15	0	1	0	9	85
Connecticut:											
Bridgeport	0	------	0	5	1	6	0	3	0	2	35
Hartford	0	------	0	0	3	6	0	5	0	7	34
New Haven	0	2	0	1	2	1	0	0	0	66	30
New York:											
Buffalo	1	------	1	45	20	43	0	4	0	4	163
New York	43	15	8	2,284	139	402	0	105	2	75	1,506
Rochester	1	------	0	0	2	5	0	1	0	2	56
Syracuse	0	------	0	102	9	15	0	1	0	2	51
New Jersey:											
Camden	0	1	0	7	6	8	0	3	0	5	44
Newark	0	4	2	8	6	122	0	7	0	22	118
Trenton	1	------	0	1	2	3	0	4	0	8	43
Pennsylvania:											
Philadelphia	2	5	4	614	50	76	0	20	2	108	561
Pittsburgh	7	6	3	18	25	73	0	9	1	26	179
Reading	0	------	0	11	1	2	0	2	0	1	34
Scranton	0	------	--------	0	------	4	0	-------	0	0	--------
Ohio:											
Cincinnati	1	------	3	24	21	32	0	10	0	0	138
Cleveland	3	37	12	79	31	65	0	7	0	98	210
Columbus	1	3	3	3	5	7	0	8	0	6	94
Toledo	0	3	3	47	10	6	0	7	0	30	81
Indiana:											
Fort Wayne	0	------	0	0	5	10	0	0	0	0	33
Indianapolis	1	------	0	2	25	65	0	8	0	8	128
Muncie	0	------	0	0	1	1	0	0	0	0	9
South Bend	0	------	2	1	4	7	0	0	0	4	23
Terre Haute	1	------	0	1	0	6	0	0	0	0	28
Illinois:											
Alton	0	------	1	0	2	2	0	0	0	0	9
Chicago	14	13	6	12	78	242	0	53	2	131	854
Elgin	0	------	0	0	1	4	0	0	0	0	12
Moline	0	1	1	0	1	9	0	1	0	3	13
Springfield	0	------	0	0	6	7	0	0	0	2	29
Michigan:											
Detroit	6	9	5	53	45	112	0	14	2	252	276
Flint	0	------	0	2	13	23	0	4	0	16	40
Grand Rapids	0	------	0	11	0	0	0	1	0	3	29
Wisconsin:											
Kenosha	0	------	0	1	1	11	0	0	0	0	9
Madison	0	------	0	3	2	9	1	1	0	6	24
Milwaukee	0	8	3	5	7	68	0	1	0	70	103
Racine	0	------	0	0	0	14	0	0	0	0	4
Superior	0	------	0	0	1	25	0	0	0	0	12
Minnesota:											
Duluth	0	------	0	2	1	6	0	0	0	16	24
Minneapolis	0	------	1	162	11	131	0	2	0	22	106
St. Paul	0	------	0	130	11	37	0	5	0	1	61
Iowa:											
Cedar Rapids	0	------	--------	0	------	4	0	-------	0	1	--------
Davenport	0	------	--------	0	------	13	0	-------	0	0	--------
Des Moines	1	------	--------	0	------	4	1	-------	0	1	44
Sioux City	0	------	--------	0	------	17	27	-------	0	0	--------
Waterloo	0	------	--------	0	------	5	0	-------	0	0	--------

City reports for week ended Apr. 25, 1936—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Missouri:											
Kansas City	0	----	2	0	17	98	0	5	0	1	101
St. Joseph	----	----	----	----	----	----	----	----	----	----	----
St. Louis	9	----	6	8	20	72	0	10	0	10	266
North Dakota:											
Fargo	0	----	0	0	1	6	1	0	0	0	16
Minot	0	----	0	0	0	1	0	0	0	0	6
South Dakota:											
Aberdeen	0	----	----	0	----	0	0	----	0	0	----
Sioux Falls	0	----	0	0	0	6	15	0	0	0	8
Nebraska:											
Omaha	9	----	1	5	12	68	9	0	0	2	61
Kansas:											
Lawrence	0	2	0	1	0	3	0	0	0	0	6
Topeka	----	----	----	----	----	----	----	----	----	----	----
Wichita	2	----	0	0	8	41	0	0	2	1	33
Delaware:											
Wilmington	0	----	0	3	5	0	0	0	0	8	31
Maryland:											
Baltimore	0	10	2	215	25	32	0	16	0	52	258
Cumberland	1	----	0	0	2	2	0	0	0	0	17
Frederick	0	----	0	6	0	0	0	0	0	0	2
Dist. of Columbia:											
Washington	13	2	0	121	30	18	0	15	0	34	193
Virginia:											
Lynchburg	1	----	0	3	0	0	0	0	0	5	7
Norfolk	0	----	0	0	3	3	0	1	1	0	37
Richmond	1	----	0	1	2	39	0	3	0	0	65
Roanoke	0	----	0	0	2	3	0	0	1	0	16
West Virginia:											
Charleston	1	2	0	1	4	0	0	3	0	0	21
Huntington	0	----	0	0	0	1	0	0	0	0	----
Wheeling	1	----	0	19	0	5	0	0	0	2	21
North Carolina:											
Gastonia	0	----	1	0	1	1	0	0	0	0	10
Raleigh	0	----	0	0	4	0	0	1	0	3	27
Wilmington	0	----	0	0	2	0	0	1	0	0	11
Winston-Salem	0	2	1	26	2	2	0	2	0	0	19
South Carolina:											
Charleston	0	10	0	0	0	1	0	1	1	0	19
Columbia	----	----	----	----	----	----	----	----	----	----	----
Florence	0	----	0	0	0	0	0	2	0	0	10
Greenville	0	----	0	14	0	0	0	0	0	0	10
Georgia:											
Atlanta	4	1	1	1	11	10	0	7	0	0	96
Brunswick	0	----	0	0	1	0	0	0	0	0	5
Savannah	1	33	1	0	2	1	0	1	1	0	18
Florida:											
Miami	3	9	0	6	2	2	0	2	0	8	29
Tampa	0	4	4	9	4	2	0	0	0	0	23
Kentucky:											
Ashland	1	----	0	0	0	1	0	0	0	9	0
Covington	2	----	0	2	1	9	0	0	0	0	7
Lexington	1	----	0	8	2	0	0	2	0	2	21
Louisville	0	----	5	34	12	17	0	3	0	6	92
Tennessee:											
Knoxville	0	----	5	22	5	2	0	2	0	0	----
Memphis	0	----	5	2	13	7	0	2	1	10	93
Nashville	2	----	4	1	10	4	0	3	0	0	61
Alabama:											
Birmingham	1	7	2	0	8	1	0	5	1	0	57
Mobile	0	----	0	0	0	1	0	1	0	0	29
Montgomery	0	----	----	0	----	0	0	----	0	0	----
Arkansas:											
Fort Smith	----	----	----	----	----	----	----	----	----	----	----
Little Rock	1	----	1	0	9	2	0	1	0	0	11
Louisiana:											
Lake Charles	0	----	0	0	5	0	0	0	0	0	6
New Orleans	6	38	14	21	19	4	1	15	1	33	171
Shreveport	----	----	----	----	----	----	----	----	----	----	----
Texas:											
Dallas	4	6	6	47	7	1	0	4	0	0	61
Fort Worth	0	----	3	0	6	2	0	2	0	0	42
Galveston	1	----	2	0	1	0	0	2	0	0	19
Houston	0	----	2	8	11	1	0	6	0	1	75
San Antonio	3	----	4	8	7	4	0	13	0	0	69

City reports for week ended Apr. 25, 1936—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases*	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Montana:											
Billings	0	------	0	0	1	6	0	0	0	2	10
Great Falls	0	------	0	0	1	5	0	0	0	4	12
Helena	0	------	0	0	0	2	3	0	0	0	9
Missoula	0	------	0	0	2	3	0	0	0	0	10
Idaho:											
Boise	0	------	0	8	1	0	0	0	0	0	10
Colorado:											
Colorado Springs	0	------	0	2	0	7	0	0	0	0	11
Denver	1	------	0	28	10	17	0	4	0	25	89
Pueblo	0	------	0	2	2	20	0	0	0	6	8
New Mexico:											
Albuquerque	0	------	0	1	2	9	0	4	0	0	19
Utah:											
Salt Lake City	0	------	0	15	3	30	2	1	0	12	28
Nevada:											
Reno	------	------	------	------	------	------	------	------	------	------	------
Washington:											
Seattle	0	------	6	177	7	23	1	9	1	4	96
Spokane	0	2	2	7	1	30	0	0	0	16	29
Tacoma	0	------	0	26	3	2	0	1	0	0	38
Oregon:											
Portland	0	------	1	32	5	10	0	0	0	10	83
Salem	1	5	------	7	------	1	3	------	0	0	------
California:											
Los Angeles	6	27	3	576	18	49	0	22	0	28	328
Sacramento	3	1	0	2	1	2	0	2	5	7	22
San Francisco	0	3	0	348	15	85	0	10	0	41	179

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	2	2	0
Rhode Island:			
Providence	0	1	0
New York:			
Buffalo	3	5	0
New York	18	6	0
New Jersey:			
Newark	2	0	0
Pennsylvania:			
Philadelphia	1	0	0
Pittsburgh	2	0	0
Reading	1	0	0
Ohio:			
Cincinnati	6	2	0
Columbus	1	0	0
Illinois:			
Chicago	14	3	0
Moline	1	1	0
Michigan:			
Detroit	2	1	0
Wisconsin:			
Milwaukee	1	1	0
Missouri:			
Kansas City	2	0	0
St. Louis	1	3	0
North Dakota:			
Fargo	0	1	0
Maryland:			
Baltimore	15	9	0
District of Columbia:			
Washington	4	2	0
Virginia:			
Lynchburg	1	0	0
Richmond	0	2	0
West Virginia:			
Huntington	2	0	0
North Carolina:			
Raleigh	1	0	0
South Carolina:			
Charleston	2	1	0
Georgia:			
Atlanta	2	0	0
Florida:			
Miami	1	0	0
Tampa	1	0	0
Kentucky:			
Louisville	1	0	0
Tennessee:			
Knoxville	1	1	0
Nashville	4	0	0
Texas:			
Galveston	4	1	0
New Mexico:			
Albuquerque	0	1	0
Utah:			
Salt Lake City	0	1	0
California:			
Los Angeles	5	3	1
San Francisco	1	0	0

Pellagra.—Cases: Philadelphia, 2; Wilmington, N. C., 1; Winston-Salem ,1; Atlanta ,1 ;Birmingham, 3; Dallas, 1; Los Angeles, 1; San Francisco, 1.

Smallpox.—Deaths: New Orleans, 1.

Typhus fever.—Cases: Mobile, 1; Fort Worth, 1; Houston, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended April 18, 1936.—During the 2 weeks ended April 18, 1936, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				1	4				1	6
Chicken pox		9		130	320	18	32	10	58	577
Diphtheria		8	5	23	8	3	1		1	49
Dysentery					2		1			3
Erysipelas		1		12	9	8		5	4	39
Influenza		16			34	30	11		1,374	1,465
Lethargic encephalitis					1					1
Measles		29	55	1,163	3,604	382	676	203	1,562	7,674
Mumps			5		1,027	33	132	30	212	1,439
Paratyphoid fever					1					1
Pneumonia		5			37		3		17	62
Poliomyelitis								1	1	2
Scarlet fever		21	3	155	457	95	49	59	40	879
Trachoma							1			1
Tuberculosis	3	5	18	117	107	28	28	3	48	357
Typhoid fever		2	1	58	2	7	2	11	2	85
Undulant fever				1	14					15
Whooping cough		12	15	92	319	4	33	4	32	511

CZECHOSLOVAKIA

Communicable diseases—February 1936.—During the month of February 1936, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	1		Paratyphoid fever	10	
Cerebrospinal meningitis	3		Poliomyelitis	16	3
Chicken pox	205		Puerperal fever	42	20
Diphtheria	2,128	139	Scarlet fever	2,373	63
Dysentery	4	1	Trachoma	145	
Influenza	716	24	Typhoid fever	299	33
Malaria	18		Typhus fever	26	1

JAMAICA

Communicable diseases—4 weeks ended April 18, 1936.—During the 4 weeks ended April 18, 1936, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		1	Poliomyelitis	1	
Chicken pox	3	36	Puerperal fever		3
Dysentery	6	7	Scarlet fever	2	
Erysipelas		3	Tuberculosis	36	78
Leprosy		1	Typhoid fever	9	83

PANAMA CANAL ZONE

Communicable diseases—January–March 1936.—During the months of January, February, and March 1936, certain communicable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities as follows:

Disease	January		February		March	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chicken pox	4		23		17	
Diphtheria	6		1	1	3	1
Dysentery (amoebic)	28		31	1	24	2
Dysentery (bacillary)	6	1	4		12	1
Leprosy	1	2			2	1
Malaria	67	9	75	1	77	3
Measles	1		1		7	
Meningococcus meningitis			1		2	2
Mumps	2				1	
Paratyphoid fever			2			
Pneumonia		27		23		10
Poliomyelitis	1	1			1	
Trachoma			1			
Tuberculosis		30		16		27
Typhoid fever	2		3		3	1
Typhus fever	2		1		1	
Whooping cough	1		6		7	

YUGOSLAVIA

Communicable diseases—March 1936.—During the month of March 1936, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	20	4	Paratyphoid fever	6	
Cerebrospinal meningitis	15	9	Scarlet fever	460	13
Diphtheria and croup	598	69	Sepsis	12	5
Dysentery	33	2	Tetanus	13	9
Erysipelas	268	5	Typhoid fever	382	43
Influenza	776	4	Typhus fever	113	3
Measles	1,601	60			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for April 24, 1936, pages 522–534. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued May 29, 1936, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

Plague

Ceylon—Kalutara.—On April 13, 1936, 1 case of bubonic plague was reported at Kalutara, Ceylon.

Indochina—Saigon-Cholon.—During the week ended April 25, 1936, 1 fatal case of plague was reported at Saigon-Cholon, Indochina.

Typhus Fever

Chile.—For the period January 23 to February 29, 1936, 430 cases of typhus fever with 94 deaths were reported in Chile by Provinces as follows: Aconcagua, 39 cases, 5 deaths; Arauco, 8 cases, 2 deaths; Bio Bio, 34 cases, 7 deaths; Cautin, 15 cases, 3 deaths; Chiloe, 1 death; Colchagua, 1 case; Concepcion, 50 cases, 7 deaths; Coquimbo, 5 cases, 2 deaths; Maule, 3 cases, 4 deaths; Nuble, 9 cases, 6 deaths; Santiago, 243 cases, 49 deaths; Talca, 3 cases, 3 deaths; and Valdivia, 20 cases, 5 deaths.

China—Hankow.—During the week ended March 28, 1936, 1 case of typhus fever was reported at Hankow, China.

Irish Free State—Mayo County—Swineford.—During the week ended April 11, 1936, 2 cases of typhus fever were reported in Swineford rural district, Mayo County, Irish Free State.

Peru.—During the month of January 1936, 143 cases of typhus fever were reported in Peru by Departments as follows: Arequipa, 11 cases; Ayacucho, 3 cases; Cuzco, 36 cases; Huanuco, 3 cases; Junin, 27 cases; Libertad, 16 cases; and Puno, 47 cases.

Yellow Fever

Bolivia—Department of Santa Cruz.—During the month of February 1936, 2 cases of yellow fever were reported in the Department of Santa Cruz, Bolivia.

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State—Dores de Campo Formoso, March 26, 1936, 1 case, 1 death, Fructal, April 6, 1936, 1 case, 1 death; Parana State—Arthur Bernardes, April 1, 1 case, 1 death, Cambara, March 26, 2 cases, 2 deaths, Jacarezinho, March 22, 1 case, 1 death, Juguariahyva, March 25, 1 case, 1 death, Londrina, March 25, 1 case, 1 death; Sao Paulo State—Assis, March 11, 1936, 1 case, 1 death, Avare, March 2 to 5, 4 cases, 4 deaths, Batataes, March 10, 1 case, 1 death, Bernardino Campos, March 4, 1 case, 1 death, Faxina, March 9 to 18, 4 cases, 4 deaths, and Pennapolis, March 26, 1 case, 1 death.

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